

Tropical Cyclone Report
Tropical Storm Nicholas
13-23 October 2003

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Nicholas was a long-lived tropical storm that remained over the Atlantic far from land.

a. Synoptic History

Nicholas developed from a tropical wave that moved westward from the coast of Africa on 9 October. A broad low pressure area formed along the wave on 10 October, and convection slowly became better organized during the following two days. It is estimated that a tropical depression formed near 0000 UTC 13 October about 790 n mi west-southwest of the southern Cape Verde Islands. The “best track” chart of the tropical cyclone’s path is given in Fig. 1, with the wind and pressure histories shown in Figs. 2 and 3, respectively. The best track positions and intensities are listed in Table 1.

The cyclone formed in an area of southerly to southwesterly vertical wind shear, and it would remain in such an environment through its lifetime. The system moved slowly west-northwestward and gradually strengthened, becoming Tropical Storm Nicholas late on 14 October. It then moved northwestward for the next three days, reaching a peak intensity of 60 kt on 17 October. A slow and erratic northward motion occurred from 18-20 October while Nicholas gradually weakened due to the shear. The storm turned west-northwestward later on 20 October and westward on 21 October. This was accompanied by slight re-intensification. Nicholas again turned northwestward on 22 October and weakening resumed. The cyclone became a depression on 23 October as it turned northward, and it became a non-convective remnant low on 24 October. The low merged with a cold front later that day, becoming extratropical about 505 n mi east-southeast of Bermuda.

The post-tropical cyclone history of Nicholas is complex. After becoming extratropical, the remnant low made a large anticyclonic loop from 24-28 October. A subsequent west-northwestward to westward motion on 28-29 October occurred while Nicholas moved along the warm front associated with a non-tropical low to its southwest. A second anticyclonic loop took place on 29-31 October, which was followed by a small cyclonic loop early on 1 November while the Nicholas low separated from the frontal system. The Nicholas remnant was finally absorbed into a non-tropical low pressure area late that day about 300 n mi south-southwest of Bermuda. This low, which developed sporadic bursts of central convection, moved westward to the Florida Peninsula on 3 November and then northwestward to the northern coast of the Gulf of Mexico on 5 November.

b. Meteorological Statistics

Observations in Nicholas (Figs. 2 and 3) include satellite-based Dvorak technique intensity estimates from the Tropical Analysis and Forecast Branch (TAFB), the Satellite Analysis Branch (SAB) and the U. S. Air Force Weather Agency (AFWA). Microwave satellite imagery from the NOAA polar-orbiting satellites, the NASA Tropical Rainfall Measuring Mission (TRMM), the NASA Quikscat, and the Defense Meteorological Satellite Program (DMSP) satellites were also useful in tracking Nicholas.

Dvorak satellite intensity estimates from all agencies suggested that Nicholas could have been a hurricane near 1200 UTC 17 October. However, several microwave images made near that time showed that the cyclone was still partly sheared, with no evidence of an eye, an eyewall, or well-defined convective bands. Thus, it is estimated that Nicholas did not reach hurricane strength and that the maximum winds were 60 kt.

The remnants of Nicholas became involved in a complex weather pattern between 27- October and 1 November, and the exact time of dissipation occurred is uncertain. Operationally, the non-tropical low that crossed Florida was occasionally referred to as the remnants of Nicholas in tropical weather outlooks issued by the National Hurricane Center. Post-analysis suggests instead that this system absorbed the remnants of Nicholas.

There are no known surface observations of tropical-storm force or stronger winds associated with Nicholas.

c. Casualty and Damage Statistics

There were no reports of damages or casualties associated with Nicholas.

d. Forecast and Warning Critique

Average official track errors (with the number of cases in parentheses) for Nicholas were 39 (39), 64 (37), 95 (35), 127 (33), 171 (29), 185 (25), and 158 (21) n mi for the 12, 24, 36, 48, 72, 96, and 120 h forecasts, respectively¹. These errors are lower than the average official track errors for the 10-yr period 1993-2002² (45, 81, 116, 150, 225, 282, and 374 n mi, respectively), (Table 2). The track forecast errors are also lower than the errors of the Climatology-Persistence model (44, 83, 125, 171, 305, 455, and 614 n mi for the 12, 24, 36, 48, 72, 96, and 120 h forecasts, respectively)

¹ All forecast verifications in this report include the depression stage of the cyclone. National Hurricane Center verifications presented in these reports prior to 2003 did not include the depression stage.

² Errors given for the 96 and 120 h periods are averages over the two-year period 2001-2.

including almost 75% lower at 120 h. By this measure, the track forecasts had significant skill.

Although the track forecast errors are quite small, the slow and erratic northward motion on 18-20 October was not well forecast. The track forecasts called for a continuing northwestward motion, which led to 24 hr track forecast errors of near 125 n mi and 48 h errors of near 200 n mi during that time.

The official track forecasts were for the most part better than the model guidance. The average errors of the GFDL model were generally the lowest of the dynamical models through 48 h and were less than those of the official forecast from 24-72 h. The GFS model (AVNO) and the medium BAM (BAMM) generally were the best of the models after 72 h and showed lower mean forecast errors than the official forecasts at 48-96 h. The consensus model GUNA had lower average errors than the official forecasts for the 36-72 hr period.

Average official intensity errors were 4, 5, 5, 7, 9, 11, and 15 kt for the 12, 24, 36, 48, 72, 96, and 120 h forecasts, respectively. For comparison, the average official intensity errors over the 10-yr period 1993-2002 are 6, 10, 13, 15, 19, 21, and 22 kt, respectively. The average intensity errors for Climatology-Persistence were 5, 7, 7, 9, 11, 15, and 20 kt, respectively. For the most part, the intensity forecasts correctly anticipated that vertical shear would restrict the development of Nicholas and eventually cause dissipation.

No watches or warnings were issued for Nicholas.

Table 1. Best track for Tropical Storm Nicholas, 13-23 October 2003.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
13 / 0000	9.5	37.0	1009	25	tropical depression
13 / 0600	9.5	37.7	1008	25	"
13 / 1200	9.6	38.4	1008	25	"
13 / 1800	9.9	38.9	1007	30	"
14 / 0000	10.2	39.5	1006	30	"
14 / 0600	10.5	40.3	1006	30	"
14 / 1200	10.7	41.1	1006	30	"
14 / 1800	10.9	41.9	1005	35	tropical storm
15 / 0000	11.2	42.5	1003	40	"
15 / 0600	11.5	43.1	1000	45	"
15 / 1200	11.8	43.7	1000	45	"
15 / 1800	12.2	44.3	1000	45	"
16 / 0000	12.6	45.0	1000	45	"
16 / 0600	13.1	45.6	1000	45	"
16 / 1200	13.5	46.0	997	50	"
16 / 1800	14.0	46.6	994	55	"
17 / 0000	14.4	47.2	995	55	"
17 / 0600	15.0	47.6	994	55	"
17 / 1200	15.5	48.0	990	60	"
17 / 1800	16.1	48.1	994	55	"
18 / 0000	16.3	48.1	994	55	"
18 / 0600	16.3	47.9	994	55	"
18 / 1200	16.5	47.8	994	55	"
18 / 1800	16.7	47.7	997	50	"
19 / 0000	17.0	47.6	997	50	"
19 / 0600	17.3	47.4	997	50	"
19 / 1200	17.6	47.3	997	50	"
19 / 1800	17.6	47.5	1000	45	"

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
20 / 0000	17.4	47.7	1000	45	"
20 / 0600	17.6	47.9	1000	45	"
20 / 1200	17.8	48.1	1002	40	"
20 / 1800	18.1	48.9	1005	35	"
21 / 0000	18.4	49.7	1005	35	"
21 / 0600	18.6	50.3	1002	40	"
21 / 1200	18.7	51.0	1000	45	"
21 / 1800	18.6	52.0	1000	45	"
22 / 0000	18.5	52.9	1002	40	"
22 / 0600	18.5	53.6	1005	35	"
22 / 1200	18.8	54.1	1005	35	"
22 / 1800	19.5	54.6	1005	35	"
23 / 0000	20.4	55.4	1005	35	"
23 / 0600	21.5	56.0	1006	30	tropical depression
23 / 1200	22.5	56.4	1007	30	"
23 / 1800	23.6	56.9	1008	30	"
24 / 0000	25.1	56.7	1009	25	low
24 / 0600	27.1	56.4	1010	25	"
24 / 1200	28.8	56.1	1011	25	"
24 / 1800	30.2	55.7	1012	25	extratropical
25 / 0000	31.4	54.8	1013	20	"
25 / 0600	32.2	53.5	1014	20	"
25 / 1200	32.4	52.0	1014	20	"
25 / 1800	32.5	50.5	1013	20	"
26 / 0000	31.9	49.5	1013	20	"
26 / 0600	30.7	49.1	1012	25	"
26 / 1200	29.3	49.0	1010	30	"
26 / 1800	28.3	49.6	1008	30	"
27 / 0000	27.4	50.5	1007	30	"

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
27 / 0600	26.7	52.0	1007	35	"
27 / 1200	26.4	53.7	1007	35	"
27 / 1800	26.6	55.5	1007	35	"
28 / 0000	27.1	57.3	1008	30	"
28 / 0600	27.9	59.1	1009	30	"
28 / 1200	28.9	60.8	1009	30	"
28 / 1800	29.5	62.8	1009	30	"
29 / 0000	29.4	65.1	1009	25	"
29 / 0600	29.3	67.1	1009	25	"
29 / 1200	29.5	68.0	1009	25	"
29 / 1800	30.1	68.0	1009	25	"
30 / 0000	30.4	67.2	1009	25	"
30 / 0600	30.4	66.4	1009	25	"
30 / 1200	30.0	65.8	1008	30	"
30 / 1800	29.3	65.3	1008	30	"
31 / 0000	28.7	65.5	1008	30	"
31 / 0600	28.3	66.0	1008	30	low
31 / 1200	27.7	66.3	1007	30	"
31 / 1800	27.0	66.4	1006	30	"
01 / 0000	26.4	66.3	1005	30	"
01 / 0600	26.5	66.0	1005	30	"
01 / 1200	27.0	66.3	1005	30	"
01 / 1800	27.7	67.0	1005	30	"
02 / 0000					absorbed by low pressure system
17 / 1200	15.5	48.0	990	60	minimum pressure

Table 2. Preliminary forecast evaluation (heterogeneous sample) for Tropical Storm Nicholas, 13-23 October 2003. Forecast errors (n mi) are followed by the number of forecasts in parentheses. Errors smaller than the NHC official forecast are shown in bold-face type. Verification includes the depression stage, but does not include the extratropical stage.

Forecast Technique	Forecast Period (h)						
	12	24	36	48	72	96	120
CLP5	44 (42)	83 (40)	125 (38)	171 (36)	305 (32)	455 (28)	614 (24)
A90E	44 (42)	82 (40)	122 (38)	167 (36)	270 (32)	394 (28)	496 (24)
A98E	44 (42)	83 (40)	120 (38)	163 (36)	265 (32)	387 (28)	487 (24)
A9UK	42 (20)	81 (19)	119 (18)	166 (17)	282 (15)		
LBAR	43 (42)	75 (40)	99 (38)	124 (36)	238 (32)	418 (28)	572 (24)
BAMD	55 (42)	89 (40)	112 (38)	129 (36)	178 (32)	239 (28)	333 (24)
BAMM	45 (42)	72 (40)	97 (38)	117 (36)	167 (32)	175 (28)	187 (24)
BAMS	53 (42)	88 (40)	115 (38)	137 (36)	190 (32)	223 (28)	251 (24)
AFII	72 (31)	149 (29)	236 (27)	309 (26)	425 (23)		
AFWI*	92 (16)	152 (15)	239 (14)	333 (13)	435 (12)		
GFNI	44 (30)	84 (28)	129 (28)	178 (26)	273 (26)		
GFDN*	46 (15)	71 (15)	104 (14)	152 (14)	243 (13)		
GFDI	36 (36)	58 (35)	77 (33)	99 (29)	162 (26)	259 (23)	402 (19)
GFDL*	42 (38)	58 (37)	74 (30)	89 (28)	145 (25)	229 (23)	373 (19)
UKMI	44 (37)	78 (35)	106 (33)	136 (31)	194 (27)	231 (23)	234 (19)
UKM*	58 (19)	86 (18)	113 (17)	135 (16)	188 (14)	222 (12)	247 (10)
NGPI	48 (39)	96 (37)	146 (35)	207 (33)	315 (30)	415 (26)	479 (22)
NGPS*	49 (38)	92 (36)	141 (34)	194 (32)	304 (30)	398 (26)	465 (22)
AVNI	45 (37)	75 (35)	99 (33)	120 (31)	133 (27)	137 (23)	173 (19)
AVNO*	53 (37)	82 (36)	105 (34)	122 (32)	139 (28)	148 (24)	177 (19)
AEMI	52 (19)	95 (18)	136 (17)	164 (16)	226 (13)	351 (9)	458 (7)
AEMN*	59 (17)	87 (16)	116 (15)	143 (14)	188 (12)	235 (9)	426 (6)
GUNS	37 (34)	68 (33)	97 (31)	128 (29)	181 (26)	247 (23)	307 (19)
GUNA	37 (34)	65 (33)	91 (31)	117 (29)	155 (26)	197 (23)	235 (19)
FSSE	40 (18)	72 (17)	97 (16)	127 (15)	170 (13)		
OFCI	40 (38)	70 (36)	103 (34)	133 (32)	176 (28)	177 (24)	157 (20)
OFCL	39 (39)	64 (37)	95 (35)	127 (33)	171 (29)	185 (25)	158 (21)
NHC Official (1993-2002 mean)	45 (2985)	81 (2726)	116 (2481)	150 (2230)	225 (1819)	282 (265)	374 (216)

* Output from these models was unavailable at time forecast issued.

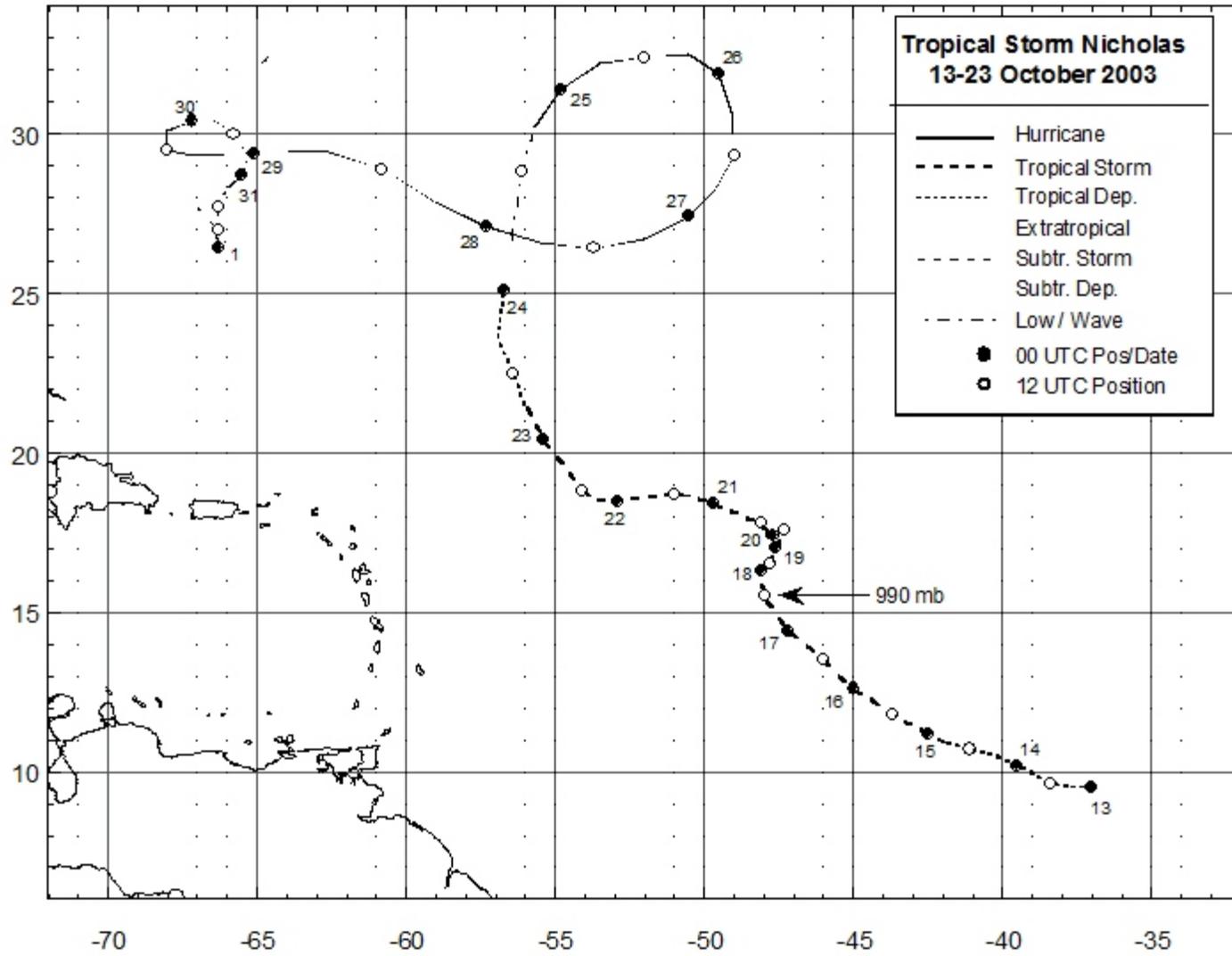


Figure 1. Best track positions for Tropical Storm Nicholas, 13-23 October 2003.

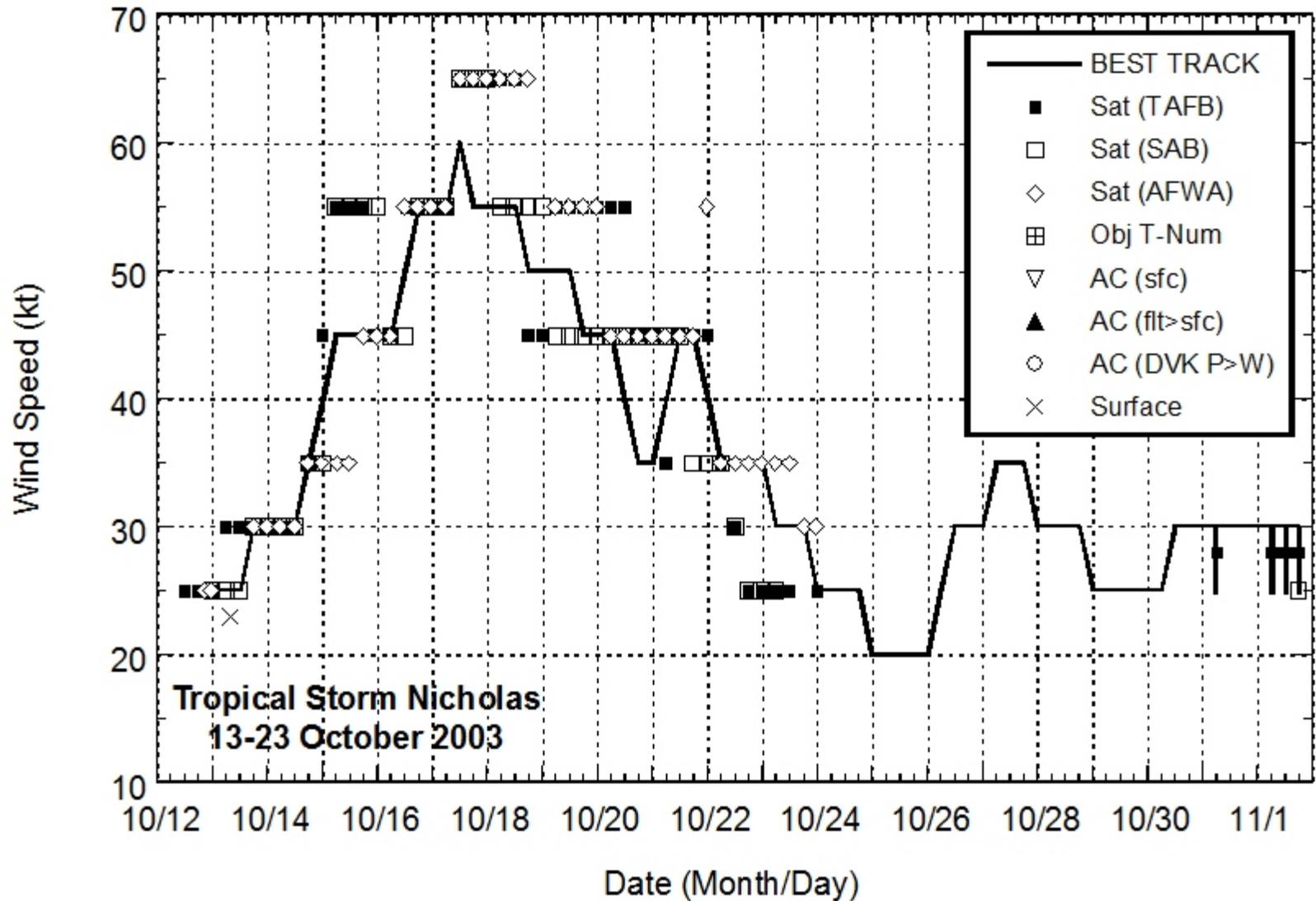


Figure 2. Selected wind estimates/observations and best track maximum sustained surface wind speed curve for Tropical Storm Nicholas, 13-23 October 2003. Solid black bars denote wind ranges for the Hebert-Poteat subtropical cyclone technique.

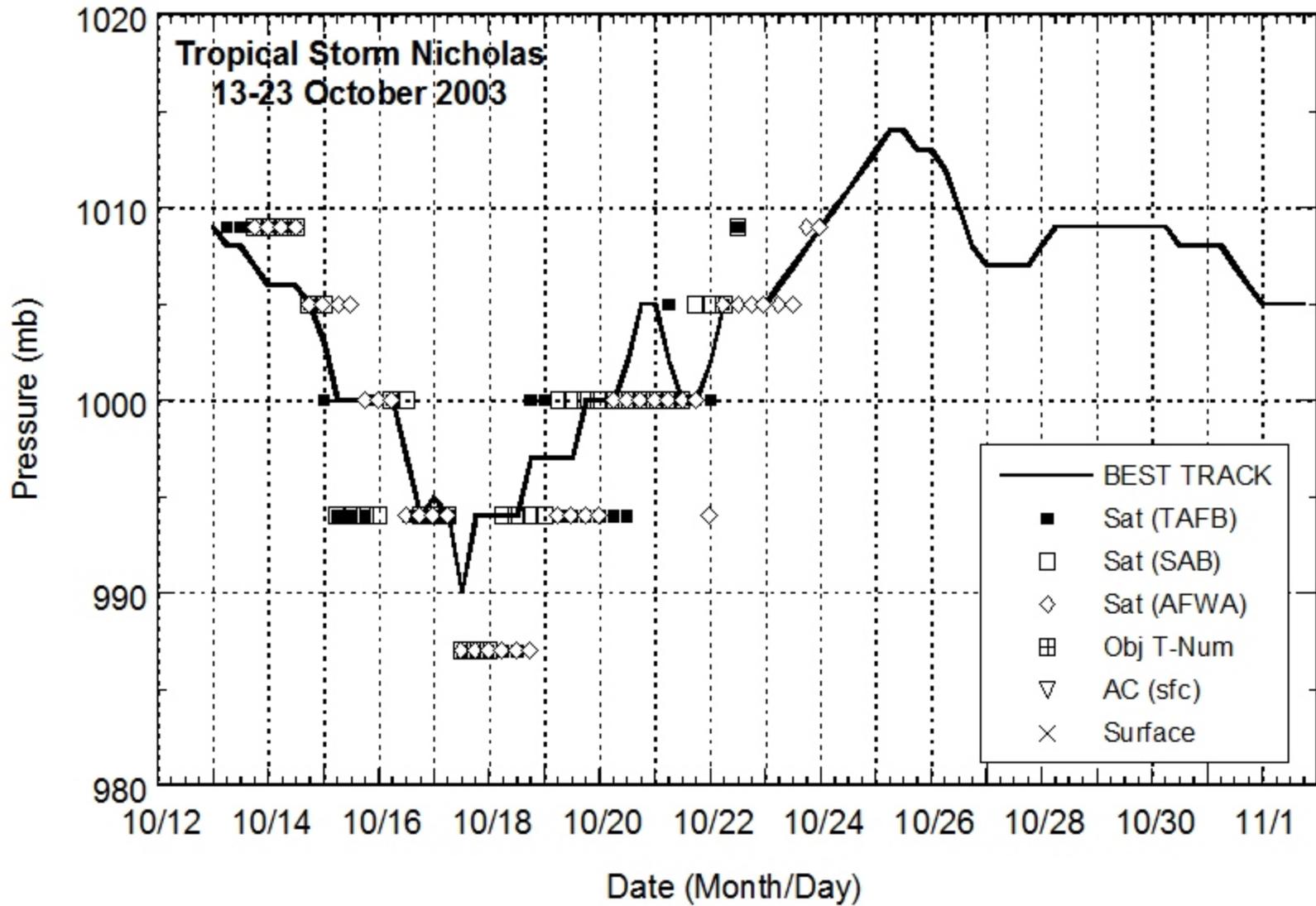


Figure 3. Selected pressure estimates and best track minimum central pressure curve for Tropical Storm Nicholas, 13-23 October 2003.